

## **ABSTRACT**

Improved methods and apparatuses are provided for conducting bi-directional signaling and testing. The outputs of at least two driver circuits are connected to a resistive network. The output signals from the driver circuits are combined through the resistive network to produce a resultant signal that is an attenuated version of at least one of the output signals. The resistive network and the driver circuits are configured such that the resultant signal is provided to an output node of the resistive network but not to an input node of the resistive network. An input/output node of an external circuit is connected to the input node of the resistive network, wherein the external circuit is configured to receive the resultant signal and output an external signal. An input node of a receiver circuit is connected to the output node of the resistive network. The resultant signal is then simultaneously provided to the external circuit and the external signal to the receiver circuit, bi-directionally through the resistive network.